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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/042,447	01/08/2002	Stephan Oliver Mietens	PHNL 010028	4625

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EXAMINER	
LERNER, MARTIN	
ART UNIT	PAPER NUMBER
2654	

DATE MAILED: 06/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/042,447	MIETENS ET AL.	
	Examiner	Art Unit	
	Martin Lerner	2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 to 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 to 25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. It is requested that Applicants provide copies of the prior art cited on Page 14 of the Specification. The Specification cites these articles in disclosing the invention, and the articles are not readily available to the Patent Office, but are relevant to understanding the invention with respect the prior art.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1 to 8, 14 to 18, 21, and 24 to 25 are rejected under 35 U.S.C. 102(e) as being anticipated by *lu et al.*

Regarding independent claims 1, 14, 15, 17, and 18, *lu et al.* discloses a method of coding coefficients, comprising:

"selecting coefficients to be calculated, out of a total set of possible coefficients that can be calculated by the given algorithm given the set of input values, in which

selection priorities depend on calculation costs of the respective possible coefficients, and calculating the selected coefficients to obtain the set of coefficients, wherein for a given coefficient the calculation cost is at least partly based on an amount of calculation steps that is required to calculate the given coefficient reduced with an amount of calculations that can be shared with the calculation of other selected coefficients" – the choice of the total number of coefficients is traded against robustness and computational cost; various embodiments provide schemes to handle the selection of coefficients to be calculated; zig-zag sequential order of coefficient coding is provided to concentrate on coefficients of energy in low frequency bands; the number of coefficients may be gradually added until a maximum preset number of coefficients are reached; only coefficients with magnitude greater than a threshold may be coded (column 7, line 35 to column 9, line 45); in one embodiment, look-up tables (LUTs) are used to save the basis functions at fixed sampling points for faster implementation; the value of basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) at fixed sampling points may be pre-calculated and stored in the LUTs for fast retrieval since they are repeated referenced during each iteration (column 8, line 61 to column 9, line 7); thus, the total computational cost is reduced with look-up tables for pre-calculated basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) at fixed sampling points, so that the computational cost for some calculations is shared for functions (Φ, Ψ^H, Ψ^V, and Ψ^D) at fixed sampling points ("reduced with an amount of calculations that can be shared with the calculation of other selected coefficients").

Regarding claims 2, 6, and 16, *Iu et al.* discloses coefficients are coded with look-up tables, where basis functions at fixed sampling points may be pre-calculated

and stored for fast retrieval since they are repeatedly referenced during each iteration (column 8, line 61 to column 9, line 9); thus, pre-calculated basis functions at fixed sampling points are "results of shared calculation steps are re-used in calculating other coefficients which share the shared calculation costs".

Regarding claims 3 and 4, *lu et al.* discloses new coefficients are added until a preset maximum number of coefficients are reached (column 7, line 60 to column 8, line 7); a maximum number of coefficients corresponds to maximizing the number of coefficients "given a maximum total calculation cost."

Regarding claim 5, *lu et al.* discloses new coefficients are added until a preset maximum number of coefficients are reached (column 7, line 60 to column 8, line 7); reaching a preset maximum number of coefficients corresponds to "until a stop criterion is met"; moreover, choosing coefficients by zig-zag scanning order and by thresholds involves minimizing the calculation cost of a coefficient with respect to other possible coefficients.

Regarding claims 7 and 8, *lu et al.* discloses thresholding of coefficients to be calculated based on gradient magnitude or residual differences (column 8, lines 9 to 41); thresholding of coefficients to be calculated represents "at least one additional criterion is used in selecting coefficients to be calculated"; zig-zag sequential ordering of coefficients under a constraint of a maximum number of coefficients or discarding coefficients whose intensity gradient magnitude is less than a threshold T_g is equivalent to "a calculation cost is weighted by a priority function"; weighting could be a delta function, e.g. weighting by "0" or "1".

Regarding claims 21, 24, and 25, *Iu et al.* discloses coefficients for vector fields are stored (column 1, lines 39 to 44); optical flow calculator 600 is "a processor to carry out the method" (column 10, lines 4 to 40: Figure 6).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 9, 19, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Iu et al.* in view of *Kim et al.*

Iu et al. discloses calculating coefficients according to zig-zag sequential scanning order (column 7, lines 53 to 60), but omits including information about the scanning order in the output signal. However, it is known to include information about the scanning order in the output signal when the scanning order is varied from a standard sequential ordering. *Kim et al.* teaches varying the scanning order by scan interleaving to reduce the number of coding bits. (Column 4, Lines 7 to 13) In that case, additional information with a decided scanning order is transmitted to the decoder. (Column 4, Lines 30 to 37: Abstract) Thus, the decoder is informed of the scanning order used during coding so that the decoder may properly decode the coded information. It would have been obvious to one having ordinary skill in the art to transmit the scan order to the decoder as taught by *Kim et al.* in the method of

calculating coefficients according to scanning order of *Iu et al.* for the purpose of reducing the number of coding bits.

6. Claims 10, 11, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Iu et al.* in view of *Lengwehasatit*.

Iu et al. discloses calculating coefficients according to zig-zag sequential scanning order (column 7, lines 53 to 60), and also says that newly added coefficients are initialized to zero (column 7, lines 61 to 67). It is well known that algorithms commonly provide for coefficients whose values are not known by setting them to zero, but *Iu et al.* does not expressly say that choice of coefficients by scanning order sets some of the coefficients to zero. However, *Lengwehasatit* teaches pruning coefficients for an Inverse Discrete Cosine Transform (IDCT) by setting 64 minus M coefficients to zero by scanning order. (Column 2, Lines 21 to 65) The objective is to reduce the complexity of performing an Inverse Discrete Cosine Transform (IDCT). (Column 2, Lines 13 to 20) It would have been obvious to one having ordinary skill in the art to set coefficients to zero by scanning order as taught by *Lengwehasatit* in the method of calculating coefficients according to scanning order of *Iu et al.* for the purpose of reducing the complexity of performing an Inverse Discrete Cosine Transform (IDCT).

7. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Iu et al.* in view of *Conkie*.

Iu et al. provides a look-up table for calculating coefficients (column 8, line 61 to column 9, line 7), but omits a database containing calculation costs of coefficients in the form of a list of which coefficients can be calculated as a function of a given maximum number of calculation steps. However, *Conkie* generally teaches a database of calculation costs in an analogous art field of endeavor, where pre-calculated units are stored as a list. (Abstract; Column 2, Lines 44 to 55; Column 4, Lines 57 to 67: Figures 5 and 6) The objective is to reduce the number of calculations performed in real time. (Abstract; column 5, Lines 15 to 53) It would have been obvious to one having ordinary skill in the art to provide a database containing calculation costs of coefficients in the form of a list of coefficients as taught by *Conkie* in the method of calculating coefficients according to scanning order of *Iu et al.* for the purpose reducing the number of calculations that must be performed in real time.

Response to Arguments

8. Applicants' arguments filed 03 March 2005 have been fully considered but they are not persuasive.

Applicants argue that *Iu et al.* fails to anticipate the claims as amended for the limitation of "wherein for a given coefficient the calculation cost is at least partly based on an amount of calculation steps that is required to calculate the given coefficient reduced with an amount of calculations that can be shared with the calculation of other selected coefficients." Applicants note that *Iu et al.* discloses the use of look-up tables to save time in computing the basis functions at fixed sampling points for faster

implementation, where the look-up tables have basis functions that are pre-calculated since they are repeatedly referenced during each subsequent iteration. Applicants state that the amended limitations are found in claims 2 and 6. However, Applicants maintain that *lu et al.* discloses information in the look-up tables may be shared, but does not disclose the calculation of the coefficients and reduction of the calculation by the shared values. This position is traversed.

lu et al. discloses a plurality of schemes to reduce the computational cost of calculating coefficients. (Column 7, Lines 35 to 52) One way to reduce computational cost is to pre-calculate and store basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) at fixed sampling points, producing a faster implementation since functions (Φ, Ψ^H, Ψ^V, and Ψ^D) are repeatedly referenced during each iteration. (Column 8, Line 61 to Column 9, Line 7) Those skilled in the art would recognize that basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) are used for calculating wavelet coefficients. *lu et al.* says that a motion transform represents motion vectors using wavelet transforms, among others, where $\Phi(k,x)$ denotes the value of the k-th basis function at pixel x, and $M_x(k)$ and $M_y(k)$ denote the coefficients of the k-th basis function for horizontal and vertical motion components. (Column 4, Line 60 to Column 5, Line 19: Equation (1)) Wavelets have an advantage in their locality property for motion estimation. Their coefficients are $M_{Nx}(k)$ and $M_{Ny}(k)$, and their corresponding basis functions are $\Phi(k,x)$. (Column 7, Lines 1 to 34)

Cherkassky et al. is cited herein as prior art for purposes only of understanding the nature of wavelet coefficients and computational reduction for coefficient calculation through look-up tables. Section 2. Model Selection for Wavelet Estimators of

Cherkassky et al., Page 844, discloses Equation (4) for a discrete wavelet basis function representation of a signal. Specifically, wavelet basis functions $\Psi_{jk}(x)$ form an orthonormal basis, where a signal is modeled as $f(x,w) = \Sigma\Sigma\, w_{jk}\, \Psi(2^j x-k)$. Thus, both w_{jk}'s and $\Psi(2^j x-k)$'s must be calculated to obtain a signal $f(x,w)$, as a signal is a linear combination of a plurality of wavelet basis functions $\Psi_{jk}(x)$. Clearly, then, if wavelet basis functions $\Psi_{jk}(x)$ are pre-calculated and stored in look-up tables, then computational cost for calculating $f(x,w)$ is reduced as only w_{jk} must be calculated at each iteration. The values for $\Psi_{jk}(x)$ are shared values, and calculation of the signal $f(x,w)$ need not provide a costly re-calculation of all the basis functions $\Psi_{jk}(x)$ for the linear combination.

Correspondingly, a wavelet representation of horizontal and vertical motion vectors $u(x,y)$ and $v(x,y)$ are obtained as a linear combination of coefficients $M_x(k)$, $M_y(k)$ and basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) for *lu et al.* (Column 7, Lines 1 to 30) If basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) are pre-calculated and stored in look-up tables, then only $M_x(k)$, $M_y(k)$ need to be calculated to obtain motion vectors $u(x,y)$ and $v(x,y)$. Basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) are pre-calculated, stored in look-up tables, and repeatedly referenced during each iteration, so they are shared for calculating motion vectors $u(x,y)$ and $v(x,y)$. There is no need to re-calculate all of the basis functions (Φ, Ψ^H, Ψ^V, and Ψ^D) for a linear combination to obtain motion vectors $u(x,y)$ and $v(x,y)$. Thus, *lu et al.* discloses a "cost is at least . . . based on an amount of calculation . . . reduced with an amount . . . that can be shared."

Therefore, the rejections of claims 1 to 8, 14 to 18, 21, and 24 to 25 under 35 U.S.C. 102(e) as being anticipated by *Iu et al.*, of claims 9, 19, 22, and 23 under 35 U.S.C. 103(a) as being unpatentable over *Iu et al.* in view of *Kim et al.*, of claims 10, 11, and 20 under 35 U.S.C. 103(a) as being unpatentable over *Iu et al.* in view of *Lengwehasatit*, and of claims 12 and 13 under 35 U.S.C. 103(a) as being unpatentable over *Iu et al.* in view of *Conkie*, are proper.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure.

Cherkassky et al. is cited as prior art for purposes of understanding a discrete wavelet basis function representation of a signal.

10. **THIS ACTION IS MADE FINAL.** Applicants are reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin Lerner whose telephone number is (571) 272-7608. The examiner can normally be reached on 8:30 AM to 6:00 PM Monday to Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571) 272-7602. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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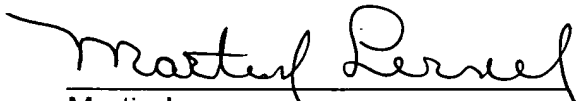

Martin Lerner
Examiner
Group Art Unit 2654